

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method for decoding a linear code, the method being executed by a decoder and comprising:

reducing $[[a]]$ density of a check matrix of the linear code by generating a new matrix of reduced density based on ~~by reducing a density of~~ elements included in the check matrix ~~and having~~ whose values $[[that]]$ are determined to be one "1";

calculating a linear combination of rows of the check matrix;

extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination;

including the lower-weight vectors as row elements of the new check matrix; and

decoding the linear code through a sum product algorithm by using the new check matrix, the decoding being performed by the decoder ~~whose density has been reduced.~~

2. (Previously Presented) The decoding method according to claim 1, wherein the linear code is a finite field including powers of prime numbers, as elements.

3. (Previously Presented) The decoding method according to claim 2, wherein the linear code includes a BCH code, or a Reed-Solomon code on the finite field.

4. (Cancelled)

5. (Currently Amended) The decoding method according to claim [[4]] 1, wherein reducing the density further includes:

expanding the check matrix by expanding a predetermined subfield of the finite field by a predetermined degree; and
calculating linear combination of the rows of the expanded check matrix.

6. (Currently Amended) A decoder for decoding a linear code, the decoder comprising:

means for reducing a density of a check matrix of the linear code by generating a new matrix of reduced density based on ~~by reducing a density of~~ elements included in the check matrix ~~and having~~ whose values ~~[[that]]~~ are determined to be one "1";

means for calculating a linear combination of rows of the check matrix;

means for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination;

means for including the lower-weight vectors as row elements of the new check matrix; and

means for decoding the linear code through a sum product algorithm by using the new check matrix ~~whose density has been reduced~~.

7. (Previously Presented) The decoder according to claim 6, wherein the linear code is a finite field including powers of prime numbers, as elements.

8. (Previously Presented) The decoder according to claim 7, wherein the linear code includes a BCH code, or a Reed-Solomon code on the finite field.
9. (Cancelled)
10. (Currently Amended) The decoder according to claim ~~[[9]]~~ 6 further comprising means for expanding the check matrix by expanding a predetermined subfield of the finite field by a predetermined degree, wherein the means for calculating calculates linear combination of rows of the expanded check matrix.
11. (Currently Amended) The decoder according to claim 6 further including means for performing soft-decision decoding on a linear code subjected to convolutional encoding, wherein the means for reducing reduces the density of a check matrix obtained by decoding the ~~convolutionally~~ convolutionally encoded linear code, the reduction being performed by reducing a density of elements included in the obtained check matrix and having values that are determined to be one "1".
12. (Previously Presented) The decoder according to claim 11, wherein the soft-decision decoding, the low-density processing, and the decoding are repetitively performed.
13. (Canceled)

14. (Currently Amended) A method for decoding a linear code, the decoding method being executed by a decoder and comprising:

inputting a reception value;

reducing density of a check matrix of the linear code by generating a new matrix of reduced density based on elements included in the check matrix whose values are determined to be one "1";

calculating a linear combination of rows of the check matrix;

extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination;

including the lower-weight vectors as row elements of the new check matrix; and

decoding the linear code through a sum product algorithm by using [[a]] the new check matrix of the linear code and the reception value, the decoding being performed by the decoder check matrix including elements having reduced density, wherein the density is reduced when it is determined that the value of one of the elements is one "1".

15. (Currently Amended) A decoder for decoding a linear code , the decoder comprising:

means for inputting a reception value;

means for reducing density of a check matrix of the linear code by generating a new matrix of reduced density based on elements included in the check matrix whose values are determined to be one "1";

means for calculating a linear combination of rows of the check matrix;

means for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination;
means for including the lower-weight vectors as row elements of the new check matrix; and

means for decoding the linear code through a sum product algorithm, by using [[a]] ~~the new check matrix of the linear code and the reception value, the check matrix including elements having reduced density, wherein the density is reduced when it is determined that the value of one of the elements is one "1".~~

16. (Currently Amended) A computer-readable storage medium storing a program for causing a computer to execute a method of decoding a linear code, the method comprising:

inputting a reception value;
reducing density of a check matrix of the linear code by generating a new matrix of reduced density based on elements included in the check matrix whose values are determined to be one "1";

calculating a linear combination of rows of the check matrix;
extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination;

including the lower-weight vectors as row elements of the new check matrix; and
decoding the linear code through a sum product algorithm by using [[a]] the new check matrix of the linear code and the reception value, the decoding being performed by the decoder ~~check matrix including elements having reduced density, wherein the~~

~~density is reduced when it is determined that the value of one of the elements is one "1".~~

17-32. (Canceled)